Symmetrix Fibre Channel with Qlogic Host Bus Adapters in the SCO UnixWare 7 Environment

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Introduction

This document describes the procedures for installing a Qlogic QLA2200F-EMC host bus adapter (HBA) into an SCO® UnixWare 7 ™ host and configuring the host for connection to EMC® Symmetrix® over Fibre Channel arbitrated loop or fabric.

Check the EMC Host Support Matrix for the latest information on approved HBAs and drivers.

This document includes the following sections:

- *Arbitrated Loop Configurations* on page 4 — Contains steps that are required to install a QLA2200F-EMC HBA into a UnixWare 7 host that will connect to Symmetrix over Fibre Channel arbitrated loop.
- *Fabric Configurations* on page 17 — Contains steps that are required to install a QLA2200F-EMC HBA into a UnixWare 7 host that will connect to Symmetrix over Fibre Channel fabric.

Arbitrated Loop Configurations

UnixWare 7 FC-AL Environment

This section lists some general Symmetrix Fibre Channel support information specific to arbitrated loop in a UnixWare 7 host environment.

Host Operating System

For the latest information, refer to the chapter on *SCO UnixWare 7 Host on Arbitrated Loop* in the *Symmetrix Fibre Channel Product Guide* (200-999-642), rev D, or contact your EMC representative.

Software Patches

For EMC-qualified patch configuration, see your EMC customer representative.

Boot Device Support

Symmetrix devices interfaced through Fibre Channel are not supported as boot devices for SCO UnixWare 7 hosts.

Hub Support

Hubs are not supported.

Addressing

If you attempt to access existing devices previously interfaced via SCSI, your raw device addressing might be changed after upgrading to Fibre Channel Directors.

Setup Checklist

The following is a step-by-step checklist of the procedures used to integrate a SCO UnixWare 7 host with the Symmetrix using the Qlogic QLA2200F-EMC HBA in an FC-AL environment. Each step includes references to the specific procedures. *Follow these steps in order, to ensure proper HBA setup.*

This installation should be performed only by personnel having a basic knowledge of SCO UnixWare 7 system administration.

Step			Done?
1.	Before beginning configuration to integrate the SCO UnixWare 7 host with the Symmetrix, ensure that all hardware and patch configurations are EMC-qualified. Obtain all EMC-qualified configurations from your EMC customer representative. Verify the following:		n/a
	a.	The host server is EMC-qualified.	
	b.	The hub (if required) is EMC-qualified.	
	c.	The patch configuration for the UnixWare 7 host is EMC-qualified.	
2.	Verify that the QLA2200F-EMC HBA is installed in the SCO UnixWare host system, and that the Symmetrix is connected to the HBA.		
	a.	For information on installing the HBA, refer to the *Qlogic Hardware Install Guide QLA2000/2000F/2100/2100F/ 2200/2200.*	
3.	Boot the host and verify the correct HBA BIOS version (1.59) and firmware settings. Upgrade the HBA BIOS if necessary.		n/a
	a.	To verify the BIOS version, refer to *Verifying the Correct HBA BIOS Version* on page 7.	
	b.	To verify the firmware settings, refer to *Setting the Firmware Variables* on page 8.	
	c.	To upgrade the HBA BIOS, refer to *Upgrading HBA Firmware/BIOS* on page 8.	

Step			Done?
4.	Use the **scan** utility function of the HBA firmware utility to verify that the HBA "sees" the Symmetrix. (Refer to *Scanning for the Symmetrix on an HBA BIOS Level* on page 10.)		
5.	Obtain the latest EMC-approved disk image driver for the QLA2200F-EMC HBA; then create a driver installation diskette and install the driver into the host:		n/a
	a.	To obtain the latest driver, refer to *Obtaining the Latest Driver* on page 11.	
	b.	To create a driver diskette, refer to *Creating the Driver Diskette* on page 12.	
	c.	To install the driver, refer to *Installing the Driver* on page 12.	
6.	Configure the qla2200 driver and rebuild the kernel:		n/a
	a.	To configure the settings in the driver configuration file **/etc/conf/pack.d/qlc2200/space.c**, refer to *Configuring the Driver Configuration File* on page 13.	
	b.	To rebuild the kernel, refer to *Rebuilding the Kernel* on page 13	
7.	After steps 1 through 6 are complete and the system has been rebooted, you will be able to see all Symmetrix raw devices in the **/dev/rdsk/** directory.		n/a
	a.	To see all targets and LUNs in the Symmetrix configuration, use the **ls /dev/rdsk/*s0** command. You can also view Symmetrix devices by issuing the **/sbin/sdiconfig -1** command.	
	b.	For an explanation of Symmetrix devices, refer to *Understanding Disk Device File Names* on page 14.	
8.	If any problems are encountered during installation or normal operation, refer to *Troubleshooting* on page 16.		

Verifying and Updating HBA BIOS-Level Configurations

Setup Checklist step 3

After installing all QLA2200F-EMC HBAs into the host, follow these steps for each QLA2200F-EMC.

Verifying the Correct HBA BIOS Version

Setup Checklist step 3a

HBA BIOS version 1.59 is required. You can determine the HBA BIOS version at boot time from the QLA2200 banner or from the QLA2200 **Fast!Util Options** menu.

- To determine the HBA BIOS version from the QLA2200 banner, boot the host and watch for the QLA2200F banner (shown in Figure 1). The banner disappears quickly, so watch carefully.
  - If the ROM BIOS version ***is not*** 1.59, upgrade the HBA BIOS as described under *Upgrading HBA Firmware/BIOS* on page 8.
  - If the ROM BIOS version *is* 1.59, continue to *Setting the Firmware Variables* on page 8.

```
Qlogic Corporation
QLA2200 PCI Fibre Channel ROM BIOS Version 1.59
Copyright © Qlogic Corporation 1993-1999 All rights reserved
Press <ALT - Q> for Fast!UTIL
www.qlogic.com
```

Figure 1 **QLA2200F-EMC Banner Example**

- To determine the HBA BIOS version from the QLA2200 **Fast!Util Options** menu:
  a. Boot the host. As soon as the QLA2200F banner (Figure 1) appears, press ALT-Q to display the **Fast!Util Options** menu.
  b. Select **Configuration Settings** from the menu.
  c. Select **Host Adapter Settings** from the **Configuration Settings** menu.
  d. Under **Host Adapter Settings**, note the **BIOS Version**:
     - If the version *is not* 1.59, upgrade the HBA BIOS as described under *Upgrading HBA Firmware/BIOS* on page 8, then go to *Setting the Firmware Variables* on page 8.
     - If the version *is* 1.59, continue to *Setting the Firmware Variables* on page 8.

Setting the Firmware Variables

Setup Checklist step 3b

This procedure assumes that you are already in **Fast!Util**. If you are not, boot the host, and as soon as the QLA2200F banner (see Figure 1 on page 7) appears, press ALT-Q to display the **Fast!Util Options** menu.

1. From the **Fast!Util Options** menu, select **Configuration Settings.**
2. On the **Configuration Settings** menu, select **Restore Default Values**.
3. On the **Configuration Settings** menu, select **Advanced Adapter Settings**.
4. Change the setting for **Execution Throttle** to **20**.
5. Change the setting for **Max Luns** to **128**. (The factory setting is **8**, but this must be changed to utilize all 128 LUNs available from the Symmetrix.)
6. Press ESC to return to the **Configuration Settings** menu.
7. On the **Configuration Settings** menu, select **Extended Firmware Settings**.
8. Change the setting for **Connection Option** to **0**.
9. Press ESC and save all changes.
10. Reboot and use the Fibre Disk utility to verify the disk media, as described under *Scanning for the Symmetrix on an HBA BIOS Level* on page 10.

Upgrading HBA Firmware/BIOS

Setup Checklist step 3c

This section contains information specific to creating HBA BIOS installation disks and upgrading the BIOS to a host bus adapter. This procedure is necessary *only* if you need to upgrade the QLA2200F-EMC BIOS version to 1.59.

Create an Installation Diskette:

To create a QLA2200 BIOS installation diskette, follow these steps:

1. Contact your EMC customer representative to obtain the HBA BIOS. The latest version might be available on the Qlogic website, as described in the steps below:
   a. Access this website: **http://www/qlogic.com.**
   b. Click **Driver Downloads.**

c. Scroll to the bottom of the Qlogic Drivers License Agreement and click **Use Qlogic Drivers/Software**.

d. Click **EMC Approved Drivers**.

e. Click **EMC Approved QLA22xx Drivers**.

f. Click **Link to ROM BIOS** in the ROM BIOS v1.59 section.

g. Save the file as **c:\22emc03bios159.zip**.

2. The file is a self-extracting ZIP file that must be extracted to a bootable diskette drive, as follows:

   a. Open any DOS window.

   b. At the DOS prompt, type **`cd \`** ENTER, to go to the root directory.

   c. Type **`22emc03bios159 a:`** ENTER.

Upgrade the BIOS

After the QLA2200-EMC HBA is installed in an EMC-qualified host, complete the following steps to upgrade the HBA BIOS:

1. Insert the BIOS upgrade installation diskette into the diskette drive.
2. Reboot the host.
3. After the host has rebooted, a DOS prompt appears. Type **`Ql2xutil /L /F`** ENTER.

The HBA BIOS upgrade might take a few minutes.

---

4. After the upgrade is complete, remove the diskette and reboot the host. During boot-up, the QLA2200F banner (see Figure 1 on page 7) should display BIOS Version 1.59.

Scanning for the Symmetrix on an HBA BIOS Level

Setup Checklist step 4

Before running SCO UnixWare 7, it is prudent to verify that Symmetrix devices are seen on an HBA BIOS level. The QLA2200 has a built in utility to verify connection to the Symmetrix port, and also to verify an individual Symmetrix device.

To verify that the HBA can "see" the Symmetrix, use the Fibre Disk utility to scan and verify disk media.

1. Under the **Fast!UTIL Options** menu, select **FIBRE DISK UTILITY**.

   This step assumes that you are already in **Fast!Util**. If you are not, boot the host, and as soon as the QLA2200F banner (see Figure 1) appears, press ALT-Q to display the **Fast!Util Options** menu.

2. You should see SYMMETRIX in a Fibre Channel device list of all possible 125 targets, as shown below. (Page down if necessary to display all targets in the list.)

```
   ID              VENDOR    PRODUCT     REV                    NODE NAME
<Hard loop ID>     EMC       SYMMETRIX   <micro code revision>  01000006048___
```

   - If SYMMETRIX appears in the list, go to step 3.
   - If SYMMETRIX does not appear in the list, verify the following, then start this procedure again at step 1:
     - that the correct Symmetrix port is connected to the host
     - that the Symmetrix is on line
     - that the cables are not damaged

3. Use the arrow keys to highlight **SYMMETRIX** from the list of targets, then press ENTER.
4. A list of LUNs appears. Select any LUN from the list.
5. A **Disk Utility Options** menu appears. Select **VERIFY DISK MEDIA**.
6. Select **CONTINUE WITH VERIFY**.

7. After media verification has completed:
   - If the message `Media Verification Complete` appears, press ESC repeatedly to exit **Fast!Util** and reboot the host, then continue with *Installing the HBA Driver* later on this page.
   - If the media verification fails, verify:
     > that the Hard Loop IDs are unique between the host bus adapter and the Symmetrix.
     > that the cables and connectors are not damaged.
     > that the host has been rebooted since the BIOS settings were changed.

Installing the HBA Driver

Setup Checklist step 5

To ensure seamless operation between the SCO Unixware 7 host and the Symmetrix while using a QLA2200F-EMC HBA, *only* an EMC-approved QLA2200 driver should be installed.

Obtaining the Latest Driver

Setup Checklist step 5a

Be sure you have the latest qualified driver software. This is available on the Qlogic website or the EMC-released CD-ROM:

To copy the EMC-approved driver from the release media:

1. Insert the CD-ROM into the UnixWare 7 host.
2. Issue the following command to mount the CD-ROM:

   `Mount -F cdfs -oro /dev/cdrom/cdrom1 /mnt` ENTER

3. Type **`cd /mnt/cdrom/qlogic/sco`** ENTER, to go to the proper driver directory on the CD.
4. Type **`cp qlc2200.Z /tmp`** ENTER, to copy the driver to the **/tmp** directory.

To obtain the EMC-approved driver from the Qlogic Web site:

1. Access **http://www/qlogic.com**.
2. Click **Driver Downloads.**
3. Scroll to the bottom of the Qlogic Drivers License Agreement and click **Use Qlogic Drivers/Software**.
4. Click **EMC Approved Drivers**.

5. Click **SCO UnixWare 7.1.1 Driver**.
6. Copy the EMC-approved UnixWare 7.1.1 driver to the **/tmp** directory your UnixWare 7 host. and save the driver as **qlc2200.Z**.

Creating the Driver Diskette

Setup Checklist step 5b

1. Type **`cd /tmp`** ENTER.
2. Type **`uncompress qlc2200.Z`** ENTER.
3. The driver is in a disk image format and should be copied onto a diskette to be installed. Insert a blank diskette into the UnixWare 7 host.
4. Type **`format /dev/rdsk/f0q18dt`** ENTER, to format the diskette.
5. To copy the disk image to the the diskette, type **`dd if=/tmp/qlc2200 of=/dev/rdsk/f0q18dt`** ENTER.

   This process takes several minutes.

6. Proceed to *Installing the Driver*.

Installing the Driver

Setup Checklist step 5c

1. Insert the EMC-approved qla2200 driver diskette into the diskette drive.
2. Type **`pkgadd -d diskette1`** ENTER to start installing the package.
3. Type **`GO`** ENTER to start scanning the diskette.
4. When the scan is complete, type **`1`** ENTER to select the QLA2200 package.
5. After installation is complete, type **`q`** ENTER to exit the package installation utility.
6. Make sure all settings in **/etc/conf/pack.d/qlc2200/space.c** are set properly. (Refer to *Configuring the HBA Driver* later on this page.)
7. Type **`shutdown`** ENTER to reboot the host.

Configuring the HBA Driver

Setup Checklist step 6

The proper configuration of the **/etc/conf/pack.d/qlc2200/space.c** file is crucial for Symmetrix host integration and driver behavior. The driver configuration file contains important information about how the driver should behave. The file is created automatically when the HBA driver is installed.

Configuring the Driver Configuration File

Setup Checklist step 6a

You can find the QLA2200F driver configuration file **space.c** in the **/etc/conf/pack.d/qlc2200** directory. The file contains two variable settings for an arbitrated loop environment.

After all changes have been made to **/etc/conf/pack.d/qlc2200/space.c**, the kernel must be rebuilt and the system rebooted.

- **qlc2200_internal_timeout** — This variable sets the timeout in case of a link-down or Symmetrix off-line condition. You should set this variable to 60 seconds to ensure proper fault tolerance:

  ```
  ushort qlc2200_internal_timeout = 60;
  ```

  After 60 seconds, mounted file systems will be disabled and all I/O to the failed device will be terminated. Because of SCO memory implementations with vxfs file systems, vxfs file systems could hang if this setting is greater than 60 seconds.

- **qlc2200_enable_binding** — Set this variable to **0** for FC-AL:

  ```
  char qlc2200_enable_binding = 0;
  ```

After all changes have been made to **/etc/conf/pack.d/qlc2200/space.c** the kernel must be rebuilt and the system rebooted. Proceed to *Rebuilding the Kernel*.

Rebuilding the Kernel

Setup Checklist step 6b

To rebuild the kernel, follow these steps:

1. Log in as *root*.
2. Type **`cd /etc/conf/bin`** ENTER to change to the correct directory.
3. Type **`./idbuild -B`** ENTER to rebuild the kernel.
4. Type **`./idcpunix`** ENTER to relink the kernel.
5. Type **`init 6`** ENTER to reboot the system.

Understanding Disk Device File Names

Setup Checklist step 7b

To better understand setting up a Symmetrix device, review the SCSI disk naming conventions. Raw disk device filenames take two forms:

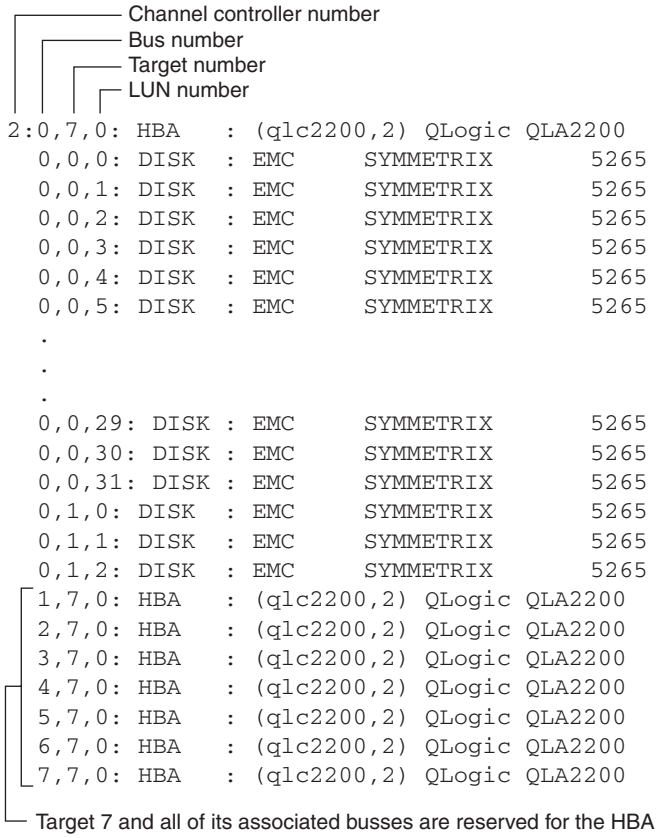
- **/dev/rdsk/c*C*b*B*t*T*d*D*s*S***
- **/dev/rdsk/c*C*b*B*t*T*d*D*p*P***

where:

- ***C*** is the occurrence of the host adapter board.
- ***B*** is the port designation for the specific HBA. (For a single-port HBA, this value is **0**.)
- ***T*** is the SCSI target ID. The Qlogic driver supports up to 32 targets per channel.
- ***D*** is the logical unit number (LUN) of the disk device. For a Fibre Channel HBA, there can be up to 32 LUNs per target.
- ***S*** is the disk slice number. For any SCSI or Fibre Channel device, ***S*** is in the range **0** through **184**. The default number of slices is in the range **0** through **15**. Slice **0** always denotes the entire disk. *Never* write data to disk **0**.
- ***P*** is the fdisk partition number. ***P*** can range from **0** through **4**. The p0 node corresponds to the whole disk, and the p1 to p4 nodes correspond to partitions displayed by the **fdisk** command.

During boot time, or if the command **/sbin/sdiconfig -l** is issued, disks under UnixWare 7 are represented as shown in the following example.

Example:


Channel controller number
Bus number
Target number
LUN number
2:0,7,0: HBA : (qlc2200,2) QLogic QLA2200
0,0,0: DISK : EMC SYMMETRIX 5265
0,0,1: DISK : EMC SYMMETRIX 5265
0,0,2: DISK : EMC SYMMETRIX 5265
0,0,3: DISK : EMC SYMMETRIX 5265
0,0,4: DISK : EMC SYMMETRIX 5265
0,0,5: DISK : EMC SYMMETRIX 5265
0,0,29: DISK : EMC SYMMETRIX 5265
0,0,30: DISK : EMC SYMMETRIX 5265
0,0,31: DISK : EMC SYMMETRIX 5265
0,1,0: DISK : EMC SYMMETRIX 5265
0,1,1: DISK : EMC SYMMETRIX 5265
0,1,2: DISK : EMC SYMMETRIX 5265
1,7,0: HBA : (qlc2200,2) QLogic QLA2200
2,7,0: HBA : (qlc2200,2) QLogic QLA2200
3,7,0: HBA : (qlc2200,2) QLogic QLA2200
4,7,0: HBA : (qlc2200,2) QLogic QLA2200
5,7,0: HBA : (qlc2200,2) QLogic QLA2200
6,7,0: HBA : (qlc2200,2) QLogic QLA2200
7,7,0: HBA : (qlc2200,2) QLogic QLA2200
Target 7 and all of its associated busses are reserved for the HBA

The above example shows a typical target and bus reservation for the QLA2200. In the example, controller number 2 sees 35 Symmetrix devices. 32 device are assigned to target 0 and 3 devices are assigned to target 1. Target numbers are reassigned by SCO regardless of the LUN number scheme assigned by the Symmetrix.

The EMC-approved driver supports multiple HBA instances. The operating system assigns each QLA2200 HBA instance a controller number (0 through 7) based on the PCI slot that contains the HBA. The QLA2200 driver supports 8 busses per HBA, 32 targets per HBA and 32 LUNs per target.

Troubleshooting

Setup Checklist step 8

This section describes some potential problems and the suggested solutions.

Problem: *I am having trouble with target 0 disk 0 of the Symmetrix.*

SCO calculates the cylinder count for the first disk added to the system improperly. SCO's calculations for the cylinder counts must be used. When using the **disksetup** command in a script, use the cylinder count displayed in the fdisk. The EMC **inq** and **fdisk** sizes will be slightly off for the first disk. All other disks added to the system will have proper cylinder counts.

Problem: *I am getting SCSI bus select failed console messages during normal I/O.*

Example:

```
Apr 12 16:08:58 hostname unix: Completion code indicates "The SCSI bus
   select failed"
```

If this condition occurs, make sure the parameter **Execution Throttle** in the HBA BIOS is set to **20**.

Problem: *I am having trouble using the **diskadd** command with a large configuration.*

If you are unable to perform **diskadd** with a large number of drives, try running **`/sbin/sdimkdtab -fi`** to recreate the device table entries, or modify the kernel parameter to raise the limit for the number of open files.

Problem: *I am having trouble using my GUI interface during heavy I/O.*

The SCO GUI uses a lot of memory. Increasing RAM size might help this condition.

Problem: *My host's boot time gets progressively longer each time I reboot.*

SCO does not always remove disk entries from the resource manager after disk configuration changes. Running the following script will force the resource manager disk table to be rebuild on reboot.

```
#
  keys=`/sbin/resmgr |grep vtoc |awk '{print $1}'`
  for key in $keys; do
     /sbin/resmgr -r -k $key
  done
  /etc/conf/bin/idconfupdate -f
```

Fabric Configurations

UnixWare 7 Fabric Environment

This section lists some general Symmetrix Fibre Channel support information specific to fabric in a UnixWare 7 host environment.

Host Operating System

For the latest information, refer to the chapter on *SCO UnixWare 7 Host on Fabric* in the *Symmetrix Fibre Channel Product Guide* (200-999-642), rev D, or contact your EMC representative.

Software Patches

For EMC-qualified patch configuration, see your EMC customer representative.

Boot Device Support

Symmetrix devices interfaced through Fibre Channel are not supported as boot devices for SCO UnixWare 7 hosts.

Setup Checklist

The following is a step-by-step checklist of the procedures used to integrate an UnixWare 7 host with the Symmetrix using the Qlogic QLA2200F-EMC HBA in an FC-SW environment. Each step includes references to the specific procedures. *Follow these steps in order, to ensure proper HBA setup*.

This installation should be performed only by personnel having a basic knowledge of UnixWare 7 system administration.

Step			Done?
1.	Before beginning configuration to integrate the SCO UnixWare 7 host with the Symmetrix, ensure that all hardware and patch configurations are EMC-qualified. Obtain all EMC-qualified configurations from your EMC customer representative. Verify the following:		n/a
	a.	The host server is EMC-qualified.	
	b.	The switch is EMC-qualified.	
	c.	The patch configuration for the UnixWare 7 host is EMC-qualified.	
2.	Verify that the QLA2200F-EMC HBA is installed in the SCO UnixWare host system, and that the Symmetrix is connected to the HBA through an EMC-qualified switch.		
	a.	For information on installing the HBA, refer to the *Qlogic Hardware Install Guide QLA2000/2000F/2100/2100F/ 2200/2200.*	
3.	Verify that the Symmetrix is configured properly for a fabric environment. This is especially important if you are using Volume Logix. Refer to *Verifying Symmetrix Configuration* on page 21.		
4.	Boot the host and verify the correct HBA BIOS version (1.59) and firmware settings. Upgrade the HBA BIOS if necessary.		n/a
	a.	To verify the BIOS version, refer to *Verifying the Correct HBA BIOS Version* on page 23.	
	b.	To verify the firmware settings, refer to *Setting the HBA BIOS Variables* on page 24.	
	c.	To upgrade the HBA BIOS, refer to *Upgrading HBA BIOS* on page 25.	

Step			Done?
5.	Use the **scan** utility function of the HBA firmware utility to verify that the HBA "sees" the Symmetrix. (Refer to *Scanning for the Symmetrix on an HBA BIOS Level* on page 27.)		
6.	Obtain the latest EMC-approved disk image driver for the QLA2200F-EMC HBA; then create a driver installation diskette and install the driver into the host:		n/a
	a.	To obtain the latest driver, refer to *Obtaining the Latest HBA Driver* on page 28.	
	b.	To create a driver diskette, refer to *Creating the Driver Diskette* on page 29.	
	c.	To install the driver, refer to *Installing the Driver* on page 29.	
7.	Change the system configuration file settings to avoid reservation conflicts. Refer to *Changing System Configuration File Settings* on page 30.		
8.	Read the conceptual information regarding disk device file names, persistent binding, and SCSI target nomenclature. *Not properly understanding this information could have disastrous results.*		
	a.	Refer to *Understanding Disk Device File Names* on page 30.	
	b.	Refer to *Understanding Persistent Binding and Configuration Steps* on page 32.	
	c.	Refer to *Understanding SCSI Target Nomenclature* on page 33.	
9.	Capture all information necessary to configure persistent binding by increasing the buffer size for the osmlog, then changing the driver configuration file, rebuilding the kernel, and rebooting.		
	a.	Refer to *Increasing osmlog Buffer Size* on page 35.	
	b.	Refer to *Configuring the Driver to Output Persistent Binding Information* on page 36.	
10.	Verify that there are no ghost names associated with Symmetrix devices. Refer to *Beware of Ghost Names* on page 37.		

Step			Done?
11.	Modify the Qlogic file **space.c** with binding information obtained from osmlog, enable persistent binding, flag and verify all other driver variables. Then rebuild the kernel and reboot.		
	a.	Refer to *Configuring and Enabling Persistent Binding* on page 38.	
	b.	Refer to *Other Driver Variables* on page 39.	
	c.	Refer to *Rebuilding the Kernel* on page 39.	
12.	After steps 1 through 6 are complete and the system has been rebooted, you will be able to see all Symmetrix raw devices in the **/dev/rdsk/** directory.		n/a
	a.	To see all targets and LUNs in the Symmetrix configuration, use the **ls /dev/rdsk/*s0** command. You can also view Symmetrix devices by issuing the **/sbin/sdiconfig -1** command.	
13.	If any problems are encountered during installation or normal operation, refer to *Troubleshooting* on page 40.		

Verifying Symmetrix Configuration

Setup Checklist step 3

Symmetrix configuration is performed by an EMC Customer Engineer (CE) through the Symmetrix service processor. The CE will configure your Symmetrix with the following settings for each Fibre Channel port:

Variable	Setting
Disk Array Mode (A-bit)	Disabled [a]
Volume Set Addressing (V-bit)	Disabled [a]
Hard Addressing (H-bit)	Disabled
Loop ID	N/A
Non-participating Mode (NP-bit)	Disabled—accept soft- assigned address if hard address is not available
Tag Command Queuing (T-bit)	Enabled
Common Serial Number (C-bit)	Disabled
Disable Queue Reset on Unit Attention (D-bit)	Disabled
Point-to-Point Mode (PP-bit)	Enabled

a. If Disk Array Mode and Volume Set Addressing are disabled, the Symmetrix defaults to Peripheral Address Mode for that port. (There is no bit setting for peripheral mode.)

Proper Symmetrix LUN configuration is essental for SCO UnixWare 7 and the QLA2200. Unixware 7 will allow only 0 to 31 luns per target, so to find 128 LUNs the OS scans four groups of 32 LUNs each. At boot time the driver scans for LUN 0. If LUN 0 is not found, the driver scans for LUN 32. If LUN 32 is not found, the driver scans for LUN 64, and if LUN 64 is not found, the driver scans for LUN 96. If Symmetrix LUN ranges do not start with 0, 32, 64 or 96, the host *cannot* detect all LUNs.

Volume Logix LUN masking ranges must also begin with 0, 32 ,64, 96. *Extreme care must be taken when LUN masking with Volume Logix*.

Example Assume a Volume Logix configuration for a fabric zone that contains two QLA2200-EMC HBAs and one Symmetrix port, with 70 LUNs:

Bad Configuration

Assume a LUN range of 0–70 as follows:

HBA	Number of Devices	LUN Range	Devices Seen by Host
1	50	0–49	c1b0t0d (0–31)
			c1b0t1d (0–17)
2	20	50–70	c2b0t2d (0–5)

The host will recognize LUNs 0–31 as target 0, 32–49 as target 1, and 64–70 as target 2. LUNs 50–63 will not be seen by the host because HBA2 does not have LUN 32 configured. Without LUN 32 configured on HBA2, LUNs 33–63 will not be scanned.

Good Configuration

For the host to recognize all 70 devices, LUN assignments should be made as follows (for example):

HBA	Number of Devices	LUN Range	Devices Seen by Host
1	50	0–49	c1b0t0d (0–31)
			c1b0t1d (0–17)
2	20	64–84	c2b0t2d (0–19)

In this example, the Symmetrix is configured with two different LUN ranges, while the Symmetrix device numbers remain the same as in the *Bad Configuration* example above. HBA1 will be allowed to use LUNs 0–49 and HBA2 will be allowed to use LUNs 64–84. With LUN ranges starting at 0 for HBA1 and 64 for HBA2, the host will see all LUNs.

Verifying and Updating HBA BIOS-Level Configurations

Setup Checklist step 4

After installing all QLA2200F-EMC HBAs into the host, verify that each HBA has the correct BIOS version, and upgrade the BIOS if necessary.

Verifying the Correct HBA BIOS Version

Setup Checklist step 4a

HBA BIOS version 1.59 is required. You can determine the HBA BIOS version at boot time from the QLA2200 banner or from the QLA2200 **Fast!Util Options** menu.

- To determine the HBA BIOS version from the QLA2200 banner, boot the host and watch for the QLA2200F banner (shown in Figure 2). The banner disappears quickly, so watch carefully.
  - If the ROM BIOS version *is not* 1.59, upgrade the HBA BIOS as described under *Upgrade the BIOS:* on page 26.
  - If the ROM BIOS version *is* 1.59, continue to *Setting the HBA BIOS Variables* on page 24.

```
Qlogic Corporation
QLA2200 PCI Fibre Channel ROM BIOS Version 1.59
Copyright © Qlogic Corporation 1993-1999 All rights reserved
Press <ALT - Q> for Fast!UTIL
www.qlogic.com
```

Figure 2 **QLA2200F-EMC Banner Example**

- To determine the HBA BIOS version from the QLA2200 **Fast!Util Options** menu:

  a. Boot the host. As soon as the QLA2200F banner (Figure 2) appears, press ALT-Q to display the **Fast!Util Options** menu.

  b. Select **Configuration Settings** from the menu.

  c. Select **Host Adapter Settings** from the **Configuration Settings** menu.

  d. Under **Host Adapter Settings**, note the **BIOS Version**:

  - If the version *is not* 1.59, upgrade the HBA BIOS as described under *Upgrading HBA BIOS* on page 25, then go to *Setting the HBA BIOS Variables* on page 24.
  - If the version *is* 1.59, continue to *Setting the HBA BIOS Variables* on page 24.

Setting the HBA BIOS Variables

Setup Checklist step 4b

This procedure assumes that you are already in **Fast!Util**. If you are not, boot the host, and as soon as the QLA2200F banner (see Figure 2) appears, press ALT-Q to display the **Fast!Util Options** menu.

1. From the **Fast!Util Options** menu, select **Configuration Settings.**
2. On the **Configuration Settings** menu, select **Restore Default Values**.
3. On the **Configuration Settings** menu, select **Advanced Adapter Settings**.
4. Change the setting for **Execution Throttle** to **20**.
5. Change the setting for **Max Luns** to **256**. (The factory setting is **8**, but this must be changed to utilize all 256 LUNs.)

   Setting **Max Luns** to its maximum value will cause the maximum number of targets to be reserved for each Symmetrix port, enabling future expansion.

6. Press ESC to return to the **Configuration Settings** menu.
7. On the **Configuration Settings** menu, select **Extended Firmware Settings**.
8. Change the setting for **Connection Option** to **1**(FC-SW only).
9. Press ESC and save all changes.
10. Use the Fibre Disk utility to verify the disk media, as described under *Scanning for the Symmetrix on an HBA BIOS Level* on page 10.
11. Reboot the host.

Upgrading HBA BIOS

Setup Checklist step 4c

This section contains information specific to creating HBA BIOS installation disks and upgrading the BIOS to a host bus adapter. This procedure is necessary only if you need to upgrade the QLA2200F-EMC BIOS version. (Refer to *Verifying the Correct HBA BIOS Version* on page 23.)

Create an Installation Diskette:

To create a QLA2200 BIOS installation diskette, follow these steps:

1. Contact your EMC customer representative to obtain the HBA BIOS. The latest version might be available on the Qlogic website, as described in the steps below:
   a. Access this website: **http://www/qlogic.com.**
   b. Click **Driver Downloads.**
   c. Scroll to the bottom of the Qlogic Drivers License Agreement and click **Use Qlogic Drivers/Software**.
   d. Click **EMC Approved Drivers**.
   e. Click **EMC Approved QLA22xx Drivers**.
   f. Click **Link to ROM BIOS** in the ROM BIOS v1.59 section.
   g. Save the file as **c:\22emc03bios159.zip**.
2. The file is a self-extracting ZIP file that must be extracted to a *bootable* diskette drive, as follows:
   a. Open any DOS window.
   b. At the DOS prompt, type **`cd \`** ENTER, to go to the root directory.
   c. Type **`22emc03bios159 a:`** ENTER.

Upgrade the BIOS:

After the QLA2200-EMC HBA is installed in an EMC-qualified host, complete the following steps to upgrade the HBA BIOS:

1. Insert the BIOS upgrade installation diskette into the diskette drive.
2. Reboot the host.
3. After the host has rebooted, a DOS prompt appears. Type **`Ql2xutil /L /F`** ENTER.

The HBA BIOS upgrade might take a few minutes.

---

4. After the upgrade is complete, remove the diskette and reboot the host. During boot-up, the QLA2200F banner (see Figure 2 on page 23) should display BIOS Version 1.59.

Scanning for the Symmetrix on an HBA BIOS Level

Setup Checklist step 5

Before running SCO UnixWare 7, it is prudent to verify that Symmetrix devices are seen on an HBA BIOS level. The QLA2200 has a built in utility to verify connection to the Symmetrix port, and also to verify an individual Symmetrix device.

To verify that the HBA can "see" the Symmetrix, use the Fibre Disk utility to scan and verify disk media.

1. Under the **Fast!UTIL Options** menu, select **FIBRE DISK UTILITY**.

   This step assumes that you are already in **Fast!Util**. If you are not, boot the host, and as soon as the QLA2200F banner (see Figure 2) appears, press ALT-Q to display the **Fast!Util Options** menu.

2. You should see `SYMMETRIX` in a Fibre Channel device list of all possible 125 targets, as shown below. Page down if necessary to display all targets in the list.

```
   ID              VENDOR    PRODUCT     REV                    NODE NAME
<Hard loop ID>     EMC       SYMMETRIX   <micro code revision>  01000006048___
```

   - If `SYMMETRIX` appears in the list, go to step 3.
   - If `SYMMETRIX` does not appear in the list, verify the following, then start this procedure again at step 1:
     - that the correct Symmetrix port is connected to the host
     - that the Symmetrix is on line
     - that the cables are not damaged
     - that the Hard Loop IDs are unique between the host bus adapter and the Symmetrix
     - that a reboot has occurred since changes were made to the HBA BIOS

3. Use the arrow keys to highlight **SYMMETRIX** from the list of targets, then press ENTER.
4. A list of LUNs appears. Select any LUN from the list.
5. A **Disk Utility Options** menu appears. Select **VERIFY DISK MEDIA**.
6. Select **CONTINUE WITH VERIFY**.

7. After media verification has completed:
   - If the message `Media Verification Complete` appears, press ESC repeatedly to exit **Fast!Util** and reboot the host, then continue with *Installing the HBA Driver* on page 11.
   - If the media verification fails, verify:
     - that the cables and connectors are not damaged.
     - that the host has been rebooted since the last HBA BIOS change.

Install the HBA Driver

Setup Checklist step 6

The SCO Unixware 7 operating system interface to the Symmetrix Fibre Channel director requires HBA driver software. The driver functions at a layer below the Unixware 7 SCSI driver to present Fibre Channel devices to the operating system as if they were standard SCSI devices. The driver is in a disk image format and must be copied to a diskette before driver installation.

Obtaining the Latest HBA Driver

Setup Checklist step 6a

Be sure you have the latest qualified driver software. This is available on the Qlogic website or the EMC-released CD-ROM:

To copy the EMC-approved driver from the release media:

1. Insert the CD-ROM into the UnixWare 7 host.
2. Issue the following command to mount the CD-ROM:

   `Mount -F cdfs -oro /dev/cdrom/cdrom1 /mnt` ENTER

3. Type **`cd /mnt/cdrom/qlogic/sco`** ENTER, to go to the proper driver directory on the CD.
4. Type **`cp qlc2200.Z /tmp`** ENTER, to copy the driver to the **/tmp** directory.

To obtain the EMC-approved driver from the Qlogic Web site:

1. Access **http://www/qlogic.com**.
2. Click **Driver Downloads.**
3. Scroll to the bottom of the Qlogic Drivers License Agreement and click **Use Qlogic Drivers**.
4. Click **EMC Approved Drivers**.
5. Click **SCO UnixWare 7.1.1 Driver**.

6. Copy the EMC-approved UnixWare 7.1.1 driver to the **/tmp** directory your UnixWare 7 host as **qlc2200.Z**.

Creating the Driver Diskette

Setup Checklist step 6b

1. Type **`cd /tmp`** ENTER.
2. Type **`uncompress qlc2200.Z`** ENTER.
3. The driver is in a disk image format and should be copied onto a diskette to be installed. Insert a blank diskette into the UnixWare 7 host.
4. Type **`format /dev/rdsk/f0q18dt`** ENTER, to format the diskette.
5. To copy the disk image to the the diskette, type **`dd if=/tmp/qlc2200 of=/dev/rdsk/f0q18dt`** ENTER.

   This process takes several minutes.

6. Proceed to *Installing the Driver*.

Installing the Driver

Setup Checklist step 6c

1. Insert the EMC-approved qla2200 driver diskette into the diskette drive.
2. Type **`pkgadd -d diskette1`** ENTER to start installing the package.
3. Type **`GO`** ENTER to start scanning the diskette.
4. When the scan is complete, type **`1`** ENTER to select the QLA2200 package.
5. After installation is complete, type **`q`** ENTER to exit the package installation utility.
6. Type **`shutdown`** ENTER to reboot the host.

Changing System Configuration File Settings

Setup Checklist step 7

SCO Unixware 7.1.1 defaults to reserve devices for specific HBAs. This poses a problem when sharing such Symmetrix devices as VCM databases with more than one HBA. To ensure proper host performance, modify the variable **sd01_do_reserve** in **/etc/conf/pack.d/sd01/space.c** to equal 0 and disable disk reservations:

```
int sd01_do_reserve = 0;
```

For changes to take effect, you must save changes, then rebuild the kernel and reboot the system:

1. Type **`cd /etc/conf/bin`** ENTER.
2. Type **`./idbuild -B`** ENTER.
3. Type **`./idcpunix`** ENTER.
4. Reboot the system.

UnixWare 7 Conventions and Persistent Binding Information

Setup Checklist step 8

This section contains some pertinent information you should read and understand before configuring the driver **/etc/conf/pack.d/qlc2200/space.c** file.

Understanding Disk Device File Names

Setup Checklist step 8a

To better understand setting up a Symmetrix device, review the SCSI disk naming conventions. Raw disk device filenames take two forms:

- **/dev/rdsk/c*C*b*B*t*T*d*D*s*S***
- **/dev/rdsk/c*C*b*B*t*T*d*D*p*P***

where:

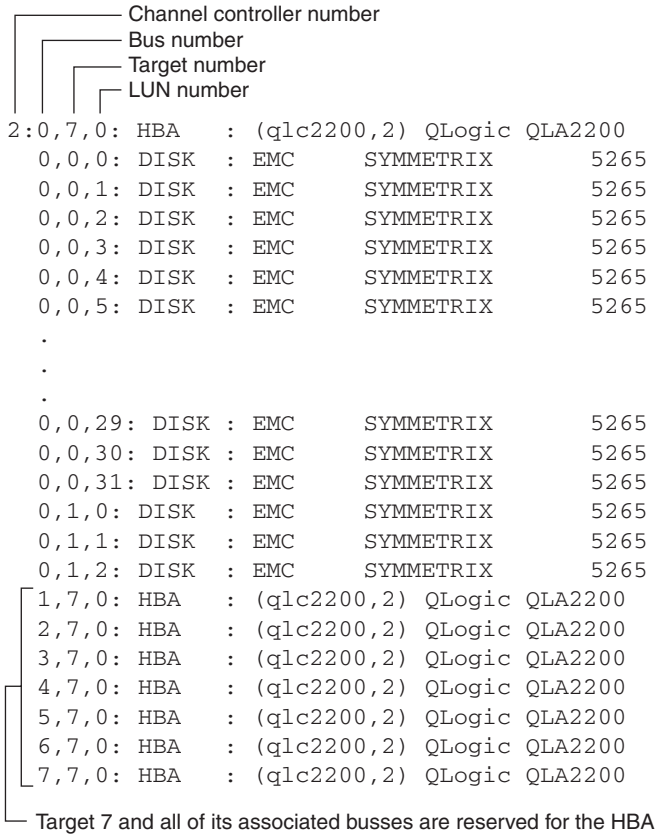
- ***C*** is the occurrence of the host adapter board.
- ***B*** is the port designation for the specific HBA. (For a single-port HBA, this value is **0**.)
- ***T*** is the SCSI target ID. The Qlogic driver supports up to 32 targets per channel.
- ***D*** is the logical unit number (LUN) of the disk device. For a Fibre Channel HBA, there can be up to 32 LUNs per target.
- ***S*** is the disk slice number. For any SCSI or Fibre Channel device, ***S*** is in the range **0** through **184**. The default number of slices is in the range **0** through **15**. Slice **0** always denotes the entire disk.

Never write data to disk **0**.

- ***P*** is the fdisk partition number. ***P*** can range from **0** through **4**. The p0 node corresponds to the whole disk, and the p1 to p4 nodes correspond to partitions displayed by the **fdisk** command.

Either during boot time, in the **var/adm/log/osmlog**, or if the command **/sbin/sdiconfig -l** is issued, disks under UnixWare 7 are represented as shown in the following example.

Example:


Channel controller number
Bus number
Target number
LUN number
2:0,7,0: HBA : (qlc2200,2) QLogic QLA2200
0,0,0: DISK : EMC SYMMETRIX 5265
0,0,1: DISK : EMC SYMMETRIX 5265
0,0,2: DISK : EMC SYMMETRIX 5265
0,0,3: DISK : EMC SYMMETRIX 5265
0,0,4: DISK : EMC SYMMETRIX 5265
0,0,5: DISK : EMC SYMMETRIX 5265
0,0,29: DISK : EMC SYMMETRIX 5265
0,0,30: DISK : EMC SYMMETRIX 5265
0,0,31: DISK : EMC SYMMETRIX 5265
0,1,0: DISK : EMC SYMMETRIX 5265
0,1,1: DISK : EMC SYMMETRIX 5265
0,1,2: DISK : EMC SYMMETRIX 5265
1,7,0: HBA : (qlc2200,2) QLogic QLA2200
2,7,0: HBA : (qlc2200,2) QLogic QLA2200
3,7,0: HBA : (qlc2200,2) QLogic QLA2200
4,7,0: HBA : (qlc2200,2) QLogic QLA2200
5,7,0: HBA : (qlc2200,2) QLogic QLA2200
6,7,0: HBA : (qlc2200,2) QLogic QLA2200
7,7,0: HBA : (qlc2200,2) QLogic QLA2200
Target 7 and all of its associated busses are reserved for the HBA

The above example shows a typical target and bus reservation for the QLA2200. In the example, controller number 2 sees 35 Symmetrix devices. 32 device are assigned to target 0 and 3 devices are assigned to target 1. Target numbers are reassigned by SCO regardless of the LUN number scheme assigned by the Symmetrix.

The EMC-approved driver supports multiple HBA instances. The operating system assigns each QLA2200 HBA instance a controller number (0 through 7) based on the PCI slot that contains the HBA. The QLA2200 driver supports 8 busses per HBA, 32 targets per HBA and 32 LUNs per target.

Understanding Persistent Binding and Configuration Steps

Setup Checklist step 8b

A requisite knowledge of persistent binding concepts is needed to configure the qla2200 driver in an FC-SW environnent. Read the information in this section for conceptual information regarding persistent binding and an explanation of configuration steps.

Persistent Binding Definition

Persistent binding is a method that ensures consistent device numbering on a target level during a power cycle or reboot. If persistent binding is not enabled in an FC-SW configuration, target numbers as seen by the host could change during a power cycle or reboot.

Configuration

To ensure FC-SW persistent binding, Qlogic driver configuration file **/etc/conf/pack.d/qlc2200/space.c** must be configured with the Worldwide names (WWNs) of Symmetrix target ports. There must be an entery for every Symmetrix port for every HBA. To get information regarding Symmetrix port WWN, the file **/etc/conf/pack.d/qlc2200/space.c** must be modified to out put information to **/var/adm/log/osmlog**.

The osmlog, a record of all boot messages, is recreated during each boot. There is a limited amount of memory allocated during boot for the osmlog. Even with a small Symmetrix configuration, the memory allotted to the osmlog might be too small to capture all information output by the qlc2200 driver. To make sure all information output from the qlogic driver is captured in the osmlog, memory space must be increased.

From the output of the osmlog, the **qla2200/space.c** file can be modified with the WWNs of the Symmetrix ports. The WWNs and a predetermined scan order can be added to the structure **binding_info_t_qlc2200_binding_info**.

With the persistent binding structure configured, persistent binding can then be enabled with the setting **qlc2200_enable_binding**.

Understanding SCSI Target Nomenclature

Setup Checklist step 8c

SCO has a limitation of 32 LUNs per target. In the HBA BIOS under advanced settings there is a **Luns per Target** setting that determines how many targets are reserved for the HBA. If the **Luns per Target** setting is changed, the target numbers of all devices on that HBA will change. **Luns per Target** must be set to 256.

0 to 32 luns will reserve 1 target
64 luns will reserve 2 targets
128 luns will reserve 4 targets
256 luns will reserve 8 targets

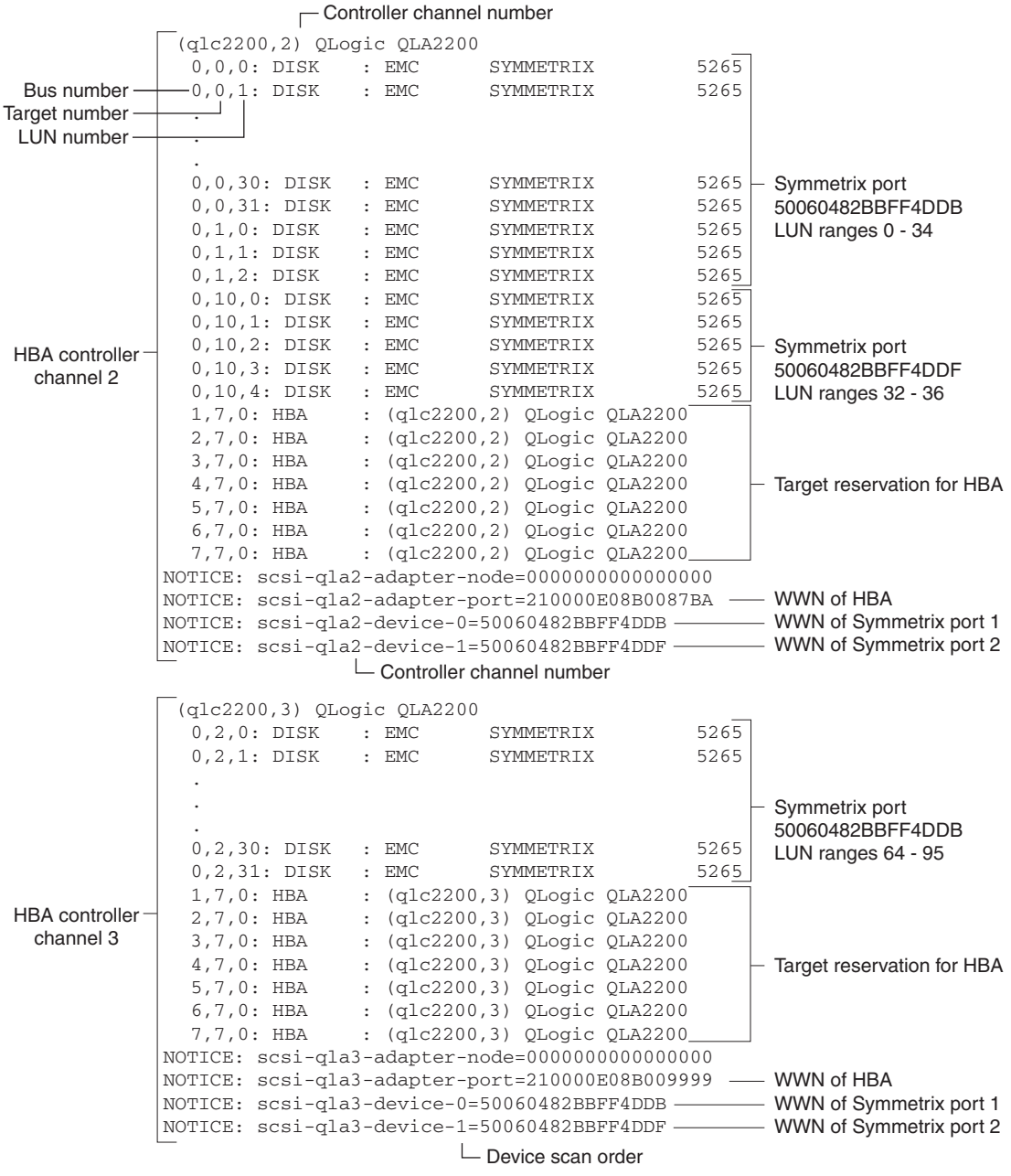
Example: In the following example, **Luns per Target** is set to 256. This will reserve 8 targets per Symmetrix port. The example shows the first HBA scanned as channel 2. Channel 2 has found two Symmetrix ports. The QLA2200 driver reserves 8 targets (0 through 7) for the first Symmetrix port scanned, but uses only targets 0 and 1. The driver reserves 8 targets (8 through 15) for the second Symmetrix port scanned, but uses only target 10.

Output of OSMLOG

The output of the osmlog can be interpreted as follows:

HBA Channel Number	Symmetrix WWN	Scan Order	Targets Reserved	Targets Mapped
C2	50060482BBFF4DDB	1st	0,1,2,3,4,5,6,7	36 total LUNs: 32 LUNs for target 0 and 4 LUNs for target 1
C2	50060482BBFF4DDF	2nd	8,9,10,11,12, 13,14,15	5 total LUNs; 5 LUNs for target 10
C3	50060482BBFF4DDB	3rd	0,1,2,3,4,5,6,7	32 total LUNs for target 2
C3	50060482BBFF4DDF	4th	8,9,10,11,12, 13,14,15	8 targets reserved with no LUNs for this Symmetrix port

Output of Qlogic-related information in osmlog.


Controller channel number
(qlc2200,2) QLogic QLA2200
0,0,0: DISK : EMC SYMMETRIX 5265
0,0,1: DISK : EMC SYMMETRIX 5265
Bus number
Target number
LUN number
0,0,30: DISK : EMC SYMMETRIX 5265
0,0,31: DISK : EMC SYMMETRIX 5265
0,1,0: DISK : EMC SYMMETRIX 5265
0,1,1: DISK : EMC SYMMETRIX 5265
0,1,2: DISK : EMC SYMMETRIX 5265
Symmetrix port 50060482BBFF4DDB LUN ranges 0 - 34
0,10,0: DISK : EMC SYMMETRIX 5265
0,10,1: DISK : EMC SYMMETRIX 5265
0,10,2: DISK : EMC SYMMETRIX 5265
0,10,3: DISK : EMC SYMMETRIX 5265
0,10,4: DISK : EMC SYMMETRIX 5265
HBA controller channel 2
Symmetrix port 50060482BBFF4DDF LUN ranges 32 - 36
1,7,0: HBA : (qlc2200,2) QLogic QLA2200
2,7,0: HBA : (qlc2200,2) QLogic QLA2200
3,7,0: HBA : (qlc2200,2) QLogic QLA2200
4,7,0: HBA : (qlc2200,2) QLogic QLA2200
5,7,0: HBA : (qlc2200,2) QLogic QLA2200
6,7,0: HBA : (qlc2200,2) QLogic QLA2200
7,7,0: HBA : (qlc2200,2) QLogic QLA2200
Target reservation for HBA
NOTICE: scsi-qla2-adapter-node=0000000000000000
NOTICE: scsi-qla2-adapter-port=210000E08B0087BA
WWN of HBA
NOTICE: scsi-qla2-device-0=50060482BBFF4DDB
WWN of Symmetrix port 1
NOTICE: scsi-qla2-device-1=50060482BBFF4DDF
WWN of Symmetrix port 2
Controller channel number
(qlc2200,3) QLogic QLA2200
0,2,0: DISK : EMC SYMMETRIX 5265
0,2,1: DISK : EMC SYMMETRIX 5265
Symmetrix port 50060482BBFF4DDB LUN ranges 64 - 95
0,2,30: DISK : EMC SYMMETRIX 5265
0,2,31: DISK : EMC SYMMETRIX 5265
1,7,0: HBA : (qlc2200,3) QLogic QLA2200
2,7,0: HBA : (qlc2200,3) QLogic QLA2200
3,7,0: HBA : (qlc2200,3) QLogic QLA2200
4,7,0: HBA : (qlc2200,3) QLogic QLA2200
5,7,0: HBA : (qlc2200,3) QLogic QLA2200
6,7,0: HBA : (qlc2200,3) QLogic QLA2200
7,7,0: HBA : (qlc2200,3) QLogic QLA2200
HBA controller channel 3
Target reservation for HBA
NOTICE: scsi-qla3-adapter-node=0000000000000000
NOTICE: scsi-qla3-adapter-port=210000E08B009999
WWN of HBA
NOTICE: scsi-qla3-device-0=50060482BBFF4DDB
WWN of Symmetrix port 1
NOTICE: scsi-qla3-device-1=50060482BBFF4DDF
WWN of Symmetrix port 2
Device scan order

Obtaining Information Needed to Configure Persistent Binding

To obtain all information necessary to configure persistent binding, the system osmlog must be configured to accept the output of the qla2200 driver. The driver must then be configured to output information to the osmlog.

Increasing osmlog Buffer Size

Setup Checklist step 9a

The *osmlog* is a file containing all messages displayed at boot time. The osm file size is limited by the buffer space available at boot time. To ensure that all information is output to the osmlog properly, perform these steps:

1. Type **`cd /etc/conf/mtune.d`** ENTER.
2. Edit the file **util** and change the line containing `PUTBUFSZ` to the following:

   ```
   PUTBUFSZ 2000 2000 60000
   ```

3. Type **`cd /etc/conf/bin`** ENTER.
4. Type **`./idtune PUTBUFSZ 60000`** ENTER.
5. Type **`./idbuild -B`** ENTER.
6. Type **`./idcpunix`** ENTER.
7. Next:
   - If **qla2200/space.c** is already configured with `qlc2200_enable_output_binding = 1`, reboot.
   - If **qla2200/space.c** has not been modified, go to *Configuring the Driver to Output Persistent Binding Information* on page 36.

Configuring the Driver to Output Persistent Binding Information

Setup Checklist step 9b

To obtain the persistant binding information needed from the osmlog, edit driver configuration file **/etc/conf/pack.d/qlc2200/space.c** as follows:

1. Modify these two lines as shown:

```
char qlc2200_enable_binding = 0;
char qlc2200_enable_output_binding = 1;
```

2. Save the changes to **space.c**; then rebuild the kernel as follows
   a. Type **`cd /etc/conf/bin`** ENTER.
   b. Type **`./idbuild -B`** ENTER.
   c. Type **`./idcpunix`** ENTER.
3. Reboot.

Beware of Ghost Names

Setup Checklist step 10

If a disk device is moved from one controller to another, the disk obtains a new address. The old address is retained as a *ghost name*, and a mapping is created between the old address and the new address. The original device node names do not change. Before configuring the driver, make sure no ghost names are present by issuing this command:

`/sbin/sdighost -l` ENTER

At the end of the device list you should see the following:

```
UX:sdighost: INFO: Currently, no names are in use as Ghost Names
```

If ghost names are present, issue this command:

`/sbin/sdighost -r` ENTER

Configuring and Enabling Persistent Binding

Setup Checklist step 11

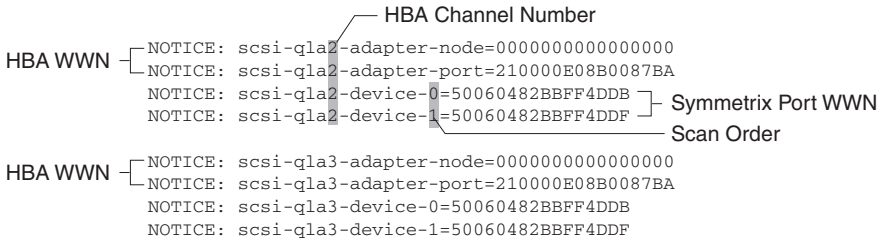
After a reboot with a larger buffer size for the osmlog and the variable **qlc2200_enable_output_binding** set to **1**, all information needed to configure persistent binding will be in **/var/adm/osmlog**.

Configuring Persistent Binding

Setup Checklist step 11a

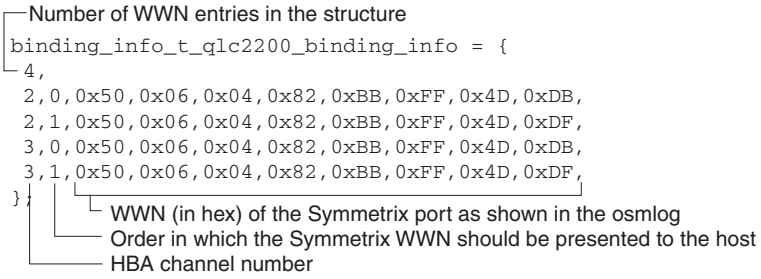
In the osmlog, after a list of all Symmetrix devices seen by the host, you should see *Notice* lines output by the qla2200 driver, similar to the example below.

Example: The following is an example of part of qla2200 driver output to the osmlog:



The first two lines refer to the WWN of the Qlogic HBA. All lines with `scsi-qla2-device` and `scsi-qla3-device` are Symmetix ports. Each Symmetrix port WWN must be entered into the structure **binding_info_t_qlc2200_binding_info** found in the file **/etc/conf/pack.d/qlc2200/space.c**.

The following is a properly configured qlc2200 binding_info structure from the above osmlog output:



After the persistent binding structure is filled in properly, the variable **char qlc2200_enable_binding** must be set to **1**. This will tell the driver to look at the structure for persistent binding order.

The kernel must be rebooted for any changes in the **/etc/conf/pack.d/qlc2200/space.c** file to take effect. Verify that all other variable in **space.c** are set in accordance with *Other Driver Variables* on page 39, then rebuild the kernel and reboot.

Other Driver Variables

Setup Checklist step 11b

Verify that the other variables in **/etc/conf/pack.d/qlc2200/space.c** are set correctly.

After changes are made to the **space.c**, the kernel must be rebuild and host rebooted.

The variable **qlc2200_internal_timeout** sets the timeout in case of a link-down or Symmetrix off-line condition. Set this variable to 60 seconds to ensure proper fault tolerance:

```
ushort qlc2200_internal_timeout = 60;
```

After 60 seconds, mounted file systems will be disabled and all I/O to the failed device will be terminated. Because of SCO memory implementations with vxfs file systems, vxfs file systems could hang if this setting is greater than 60 seconds. With very large configurations, this variable may need to be set to 30 seconds.

Rebuilding the Kernel

Setup Checklist step 11c

After verifying that all settings in **/etc/conf/pack.d/qlc2200/space.c** are correct, save the file, then rebuild the kernel and reboot:

1. Type **`cd /etc/conf/bin`** ENTER.
2. Type **`./idbuild -B`** ENTER.
3. Type **`./idcpunix`** ENTER.
4. Reboot.

Troubleshooting

Setup Checklist step 13

This section describes some potential problems and the suggested solutions.

Problem: *I am having trouble with target 0 disk 0 of the Symmetrix.*

SCO calculates the cylinder count for the first disk added to the system improperly. SCO's calculations for the cylinder counts must be used. When using the **disksetup** command in a script, use the cylinder count displayed in the fdisk. The EMC **inq** and **fdisk** sizes will be slightly off for the first disk. All other disks added to the system will have proper cylinder counts.

Problem: *I am getting SCSI bus select failed console messages during normal I/O.*

Example:

```
Apr 12 16:08:58 hostname unix: Completion code indicates "The SCSI bus
   select failed"
```

If this condition occurs, make sure the parameter **Execution Throttle** in the HBA BIOS is set to **20**.

Problem: *I am having trouble using the **diskadd** command with a large configuration.*

If you are unable to perform **diskadd** with a large number of drives, try running **`/sbin/sdimkdtab -fi`** to recreate the device table entries, or modify the kernel parameter to raise the limit for the number of open files.

Problem: *I am having trouble using my GUI interface during heavy I/O.*

The SCO GUI uses a lot of memory. Increasing RAM size might help this condition.

Problem: *My host's boot time gets progressively longer each time I reboot.*

SCO does not always remove disk entries from the resource manager after disk configuration changes. Running the following script will force the resource manager disk table to be rebuild on reboot.

```
#
  keys=`/sbin/resmgr |grep vtoc |awk '{print $1}'`
  for key in $keys; do
     /sbin/resmgr -r -k $key
  done
  /etc/conf/bin/idconfupdate -f
```